

# PCI8304

## User's Manual

 **Beijing ART Technology Development Co., Ltd.**

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## Chapter 1 Overview

In the fields of Real-time Signal Processing, Digital Image Processing and others, high-speed and high-precision data acquisition modules are demanded. ART PCI8304 data acquisition module, which brings in advantages of similar products that produced in china and other countries, is convenient for use, high cost and stable performance.

ART PCI8304 is a data acquisition module based on PCI bus. It can be directly inserted into IBM-PC/AT or a computer which is compatible with PCI8304 to constitute the laboratory, product quality testing center and systems for different areas of data acquisition, waveform analysis and processing. It may also constitute the monitoring system for industrial production process.

### Technical Characteristic

- 32 bit bus, support PCI2.2 protocol and achieve plug and play
- The design of FPGA Interface CMOS chip has the utmost confidentiality, especially suit OEM cooperation with our partners.

### Unpacking Checklist

Check the shipping carton for any damage. If the shipping carton and contents are damaged, notify the local dealer or sales for a replacement. Retain the shipping carton and packing material for inspection by the dealer.

Check for the following items in the package. If there are any missing items, contact your local dealer or sales.

- PCI8304 Data Acquisition Board
- ART Disk
  - a) user's manual (pdf)
  - b) drive
  - c) catalog
- Warranty Card

## FEATURES

### Digital Output

- Output Range:  $\pm 10V$ ,  $\pm 5V$ ,  $\pm 2.5$ ,  $0\sim 10V$ ,  $0\sim 5V$
- 16-bit resolution
- Update Rate: 100KS/s/ch (max)
- Channel No.: 32-channel synchronization
- Output Type: Opto-Isolated Analog Output
- Isolation Voltage: 2500Vrms(1min)
- Trigger Source: software trigger, hardware trigger(external trigger)
- Trigger Mode: single, continuous, single-step and emergency trigger
- Trigger Direction: falling edge and rising edge
- Clock Source: external clock, internal clock( software-configurable)
- Support multi-card synchronization (max 4 cards)
- Analog Output Impedance:  $50\Omega$
- Non-linear error:  $\pm 1LSB$ (Maximum)
- Operating Temperature Range:  $0^{\circ}C\sim 55^{\circ}C$

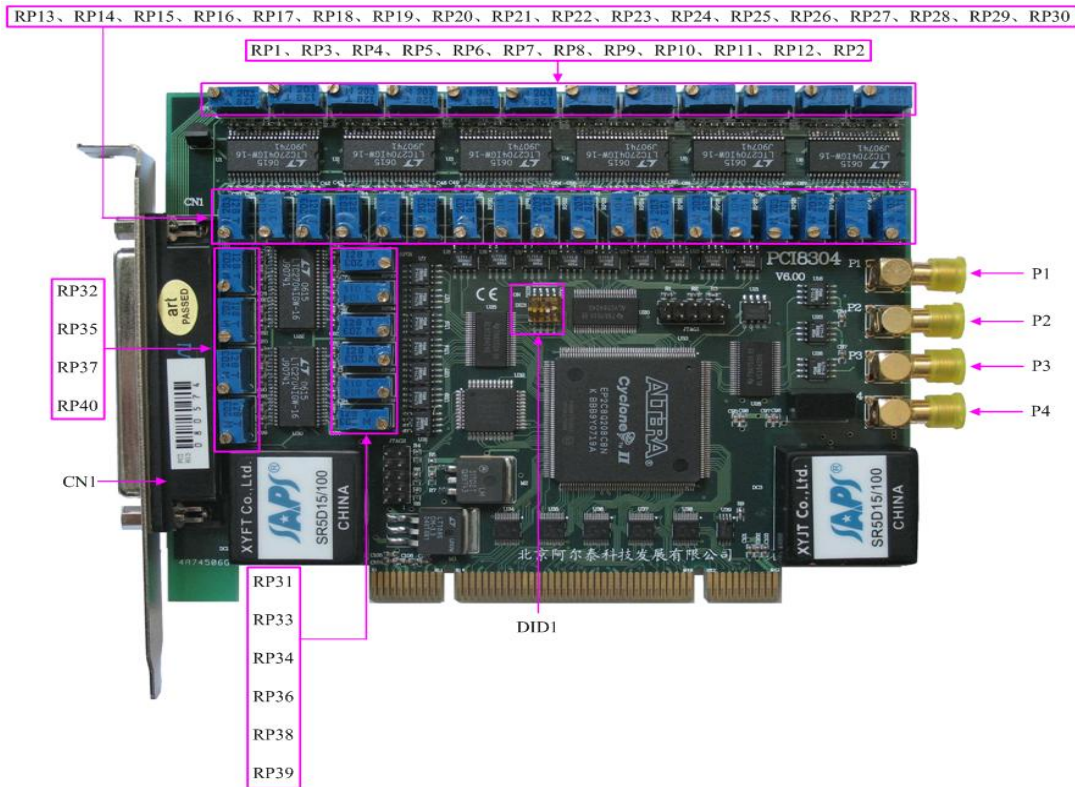
- Storage Temperature Range: -20°C~70°C

### **Other Features**

Board Clock Oscillation: 40MHz

## Chapter 2 Components Layout Diagram and a Brief Description

### 2.1 The Main Component Layout Diagram



### 2.2 The Function Description for the Main Component

#### 2.2.1 Signal Input and Output Connectors

CN1: analog output connector

P2: sync pulse signal, external trigger signal input port (CLKIN)

P1, P3, P4: sync pulse signal output interface (CLKOUT1~3)

#### 2.2.2 Potentiometer

RP29: AO0~AO3 zero point adjustment potentiometer

RP2: AO0 full-scale adjustment potentiometer

RP30: AO1 full-scale adjustment potentiometer

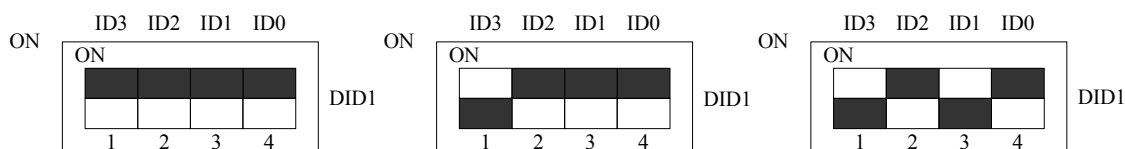
RP28: AO2 full-scale adjustment potentiometer

RP12: AO3 full-scale adjustment potentiometer

RP26:	AO4~AO7 zero point adjustment potentiometer
RP11:	AO4 full-scale adjustment potentiometer
RP27:	AO5 full-scale adjustment potentiometer
RP25:	AO6 full-scale adjustment potentiometer
RP10:	AO7 full-scale adjustment potentiometer
RP23:	AO8~AO11 zero point adjustment potentiometer
RP9:	AO8 full-scale adjustment potentiometer
RP24:	AO9 full-scale adjustment potentiometer
RP22:	AO10 full-scale adjustment potentiometer
RP8:	AO11 full-scale adjustment potentiometer
RP20:	AO12~AO15 zero point adjustment potentiometer
RP7:	AO12 full-scale adjustment potentiometer
RP21:	AO13 full-scale adjustment potentiometer
RP19:	AO14 full-scale adjustment potentiometer
RP6:	AO15 full-scale adjustment potentiometer
RP17:	AO16~AO19 zero point adjustment potentiometer
RP5:	AO16 full-scale adjustment potentiometer
RP18:	AO17 full-scale adjustment potentiometer
RP16:	AO18 full-scale adjustment potentiometer
RP4:	AO19 full-scale adjustment potentiometer
RP14:	AO20~AO23 zero point adjustment potentiometer
RP3:	AO20 full-scale adjustment potentiometer
RP15:	AO21 full-scale adjustment potentiometer
RP13:	AO22 full-scale adjustment potentiometer
RP1:	AO23 full-scale adjustment potentiometer
RP33:	AO24~AO27 zero point adjustment potentiometer
RP32:	AO24 full-scale adjustment potentiometer
RP31:	AO25 full-scale adjustment potentiometer
RP34:	AO26 full-scale adjustment potentiometer
RP35:	AO27 full-scale adjustment potentiometer
RP38:	AO28~AO31 zero point adjustment potentiometer
RP37:	AO28 full-scale adjustment potentiometer
RP36:	AO29 full-scale adjustment potentiometer
RP39:	AO30 full-scale adjustment potentiometer
RP40:	AO31 full-scale adjustment potentiometer

### 2.2.3 Physical ID of DIP Switch

DID1: Set physical ID number. When the PC is installed more than one PCI8304 , you can use the DIP switch to set a physical ID number for each board, which makes it very convenient for users to distinguish and visit each board in the progress of the hardware configuration and software programming. The following four-place numbers are expressed by the binary system: When DIP switch points to "ON", that means "1", and when it points to the other side, that means "0." As they are shown in the following diagrams: place "ID3" is the high bit."ID0" is the low bit, and the black part in the diagram represents the location of the switch. (Test software of the company often uses the logic ID management equipments and at this moment the physical ID DIP switch is invalid. If you want to use more than one kind of the equipments in one and the same system at the same time, please use the physical ID as much as possible. As for the differences between logic ID and physical ID, please refer to the function explanations of "CreateDevice" and "CreateDeviceEx" of *The Prototype Explanation of Device Object Management Function* in *PCI8304S* software specification).



The above chart shows "1111", so it means that the physical ID is 15.

The above chart shows "0111", so it means that the physical ID is 7.

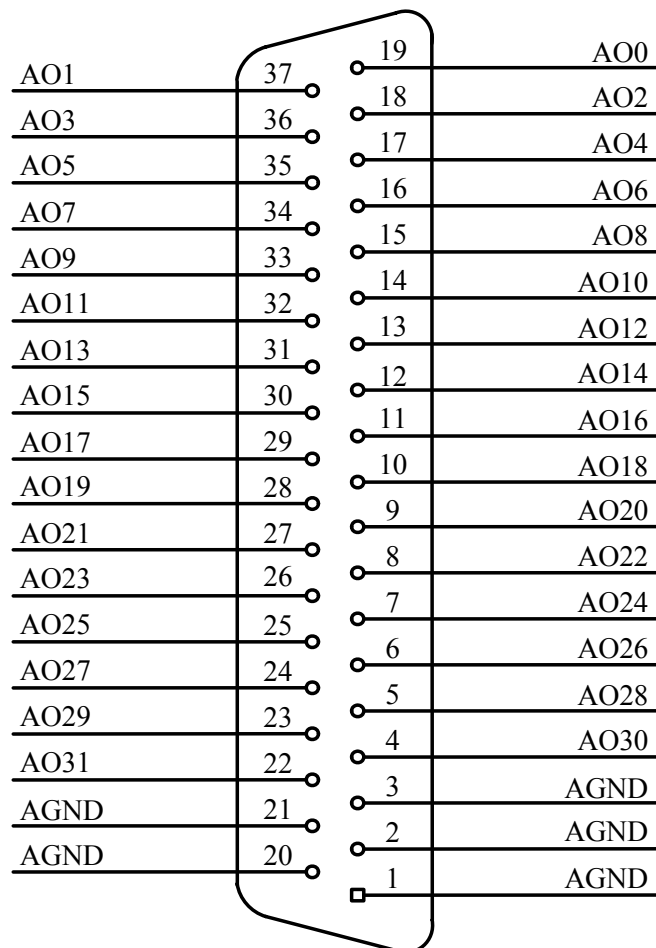
The above chart shows "0101", so it means that the physical ID is 5.

ID3	ID2	ID1	ID0	Physical ID (Hex)	Physical ID (Dec)
OFF (0)	OFF (0)	OFF (0)	OFF (0)	0	0
OFF (0)	OFF (0)	OFF (0)	ON (1)	1	1
OFF (0)	OFF (0)	ON (1)	OFF (0)	2	2
OFF (0)	OFF (0)	ON (1)	ON (1)	3	3
OFF (0)	ON (1)	OFF (0)	OFF (0)	4	4
OFF (0)	ON (1)	OFF (0)	ON (1)	5	5
OFF (0)	ON (1)	ON (1)	OFF (0)	6	6
OFF (0)	ON (1)	ON (1)	ON (1)	7	7
ON (1)	OFF (0)	OFF (0)	OFF (0)	8	8
ON (1)	OFF (0)	OFF (0)	ON (1)	9	9
ON (1)	OFF (0)	ON (1)	OFF (0)	A	10
ON (1)	OFF (0)	ON (1)	ON (1)	B	11
ON (1)	ON (1)	OFF (0)	OFF (0)	C	12
ON (1)	ON (1)	OFF (0)	ON (1)	D	13
ON (1)	ON (1)	ON (1)	OFF (0)	E	14
ON (1)	ON (1)	ON (1)	ON (1)	F	15

## Chapter 3 Signal Connectors

### 3.1 The Definition of Signal Input and Output Connectors

37 core plug on the CN1 pin definition



Pin definition

Signal Name	Type	Definition
AO0~AO31	Output	Analog signal output pins, the reference ground is AGND.
AGND	GND	Analog signal ground.



## Chapter 4 Connection Ways for Each Signal

### 4.1 Analog Signal Output Connection

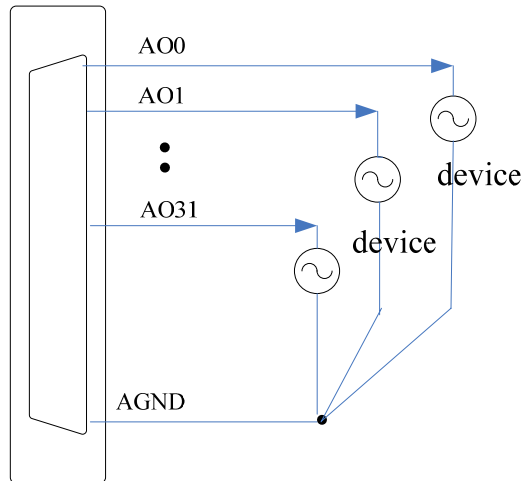
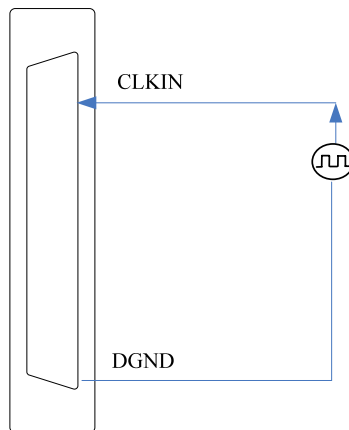


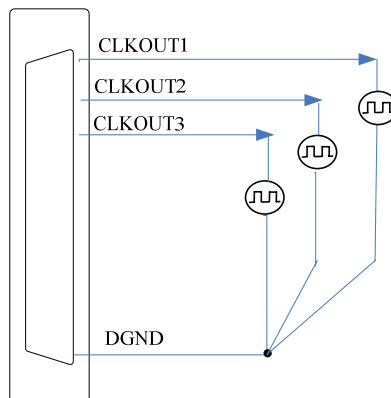
Figure 4.1 analog signal output connection

### 4.2 Synchronous Trigger Pulse Signal Connection

Synchronous trigger pulse signal input connection



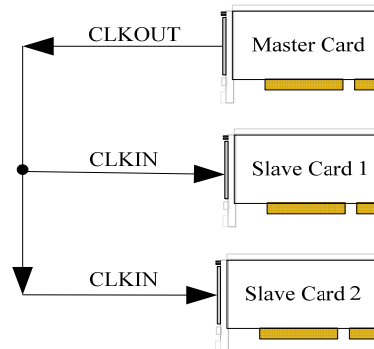
Synchronous trigger pulse signal output connection



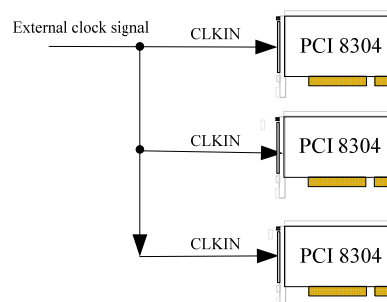
### 4.3 Methods of Realizing the Multi-card Synchronization

Three methods can realize the synchronization for the PCI8304, the first method is using the cascade master-slave card, the second one is using the common external trigger.

When using master-slave cascade card programs, the master card generally uses the internal clock source model, while the slave card uses the external clock source mode. After the master card and the slave card are initialized according to the corresponding clock source mode. At first, start all the slave cards, as the main card has not been activated and there is no output clock signal, so the slave card enters the wait state until the main card was activated. At this moment, the multi-card synchronization has been realized. When you need to sample more than channels of a card, you could consider using the multi-card cascaded model to expand the number of channels.



When using the common external trigger, please make sure all parameters of different PCI8304 are the same. At first, configure hardware parameters, then connect the signal that will be sampled by PCI8304, input triggering signal from P2, then click “Start” button, at this time, PCI8304 does not sample any signal but waits for external trigger signal. When each module is waiting for external trigger signal, use the common external trigger signal to startup modules, at last, we can realize.



## ***Chapter 5 The Instruction of the Trigger Function***

### **5.1 Internal Trigger Mode**

When D/A is in the initialization, if the DA hardware parameter SetModeDA selects internal trigger, we can achieve the internal trigger acquisition. In this function, when calling the GetStat function, it will generate D/A start pulse, D/A immediately access to the conversion process and not waits for the conditions of any other external hardware. It also can be interpreted as the software trigger.

### **5.2 External Trigger Mode**

When D/A is in the initialization, if the D/A hardware parameter SetModeDA selects external trigger, we can achieve the external trigger acquisition. In this function, when calling the GetStat function, D/A will not immediately access to the conversion process but wait for the external trigger source signals accord with the condition, then start converting the data. It also can be interpreted as the hardware trigger.

When DAPara.TriggerDir = PCI8304\_TRIGDIR\_NEGATIVE, choose the trigger direction as the falling edge trigger. That is, when the CLKIN trigger signal is on the falling edge, D/A will immediately access to the conversion process.

When DAPara.TriggerDir = PCI8304\_TRIGDIR\_POSITIVE, choose the trigger direction as rising edge trigger. That is, when the CLKIN trigger signal is on the rising edge, D/A will immediately access to the conversion process.

## ***Chapter 6 Notes, Calibration and Warranty Policy***

### **6.1 Notes**

In our products' packing, user can find a user manual, a PCI8304 module and a quality guarantee card. Users must keep quality guarantee card carefully, if the products have some problems and need repairing, please send products together with quality guarantee card to ART, we will provide good after-sale service and solve the problem as quickly as we can.

When using PCI8304, in order to prevent the IC (chip) from electrostatic harm, please do not touch IC (chip) in the front panel of PCI8304 module.

### **6.2 Analog Signal Output Calibration**

Every device has to be calibrated before sending from the factory. It is necessary to calibrate the module again if users want to after using for a period of time or changing the input range. In the manual, we introduce how to calibrate PCI8304 in  $\pm 10V$ ; calibrations of other ranges are similar.

- 1) Connect the ground of the digital voltage meter to any analog AGND of the CN137 core D-type plug. Connect the input side of the voltage meter to the output channel which needs calibration.
- 2) To set AO output is 2048, adjust potentiometer RP29 in order to make AO0 output 0.000V.
- 3) To set AO output is 65535, adjust potentiometer RP2 in order to make AO0 output voltage value is 9999.69mV
- 4) Repeat steps above until meet the requirement.

### **6.3 Warranty Policy**

Thank you for choosing ART. To understand your rights and enjoy all the after-sales services we offer, please read the following carefully.

1. Before using ART's products please read the user manual and follow the instructions exactly. When sending in damaged products for repair, please attach an RMA application form which can be downloaded from: [www.art-control.com](http://www.art-control.com).
2. All ART products come with a limited two-year warranty:
  - The warranty period starts on the day the product is shipped from ART's factory
  - For products containing storage devices (hard drives, flash cards, etc.), please back up your data before sending them for repair. ART is not responsible for any loss of data.
  - Please ensure the use of properly licensed software with our systems. ART does not condone the use of pirated software and will not service systems using such software. ART will not be held legally responsible for products shipped with unlicensed software installed by the user.
3. Our repair service is not covered by ART's guarantee in the following situations:
  - Damage caused by not following instructions in the User's Manual.
  - Damage caused by carelessness on the user's part during product transportation.

- Damage caused by unsuitable storage environments (i.e. high temperatures, high humidity, or volatile chemicals).
  - Damage from improper repair by unauthorized ART technicians.
  - Products with altered and/or damaged serial numbers are not entitled to our service.
4. Customers are responsible for shipping costs to transport damaged products to our company or sales office.
5. To ensure the speed and quality of product repair, please download an RMA application form from our company website.

# Products Rapid Installation and Self-check

## Rapid Installation

Product-driven procedure is the operating system adaptive installation mode. After inserting the disc, you can select the appropriate board type on the pop-up interface, click the button **【driver installation】** ; or select CD-ROM drive in Resource Explorer, locate the product catalog and enter into the APP folder, and implement Setup.exe file. After the installation, pop-up CD-ROM, shut off your computer, insert the PCI card. If it is a USB product, it can be directly inserted into the device. When the system prompts that it finds a new hardware, you do not specify a drive path, the operating system can automatically look up it from the system directory, and then you can complete the installation.

## Self-check

At this moment, there should be installation information of the installed device in the Device Manager (when the device does not work, you can check this item.). Open "Start -> Programs -> ART Demonstration Monitoring and Control System -> Corresponding Board -> Advanced Testing Presentation System", the program is a standard testing procedure. Based on the specification of Pin definition, connect the signal acquisition data and test whether DA is normal or not. Connect the input pins to the corresponding output pins and use the testing procedure to test whether the switch is normal or not.

## Delete Wrong Installation

When you select the wrong drive, or viruses lead to driver error, you can carry out the following operations: In Resource Explorer, open CD-ROM drive, run Others-> SUPPORT-> PCI.bat procedures, and delete the hardware information that relevant to our boards, and then carry out the process of section I all over again, we can complete the new installation.